

1 We claim:

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- 3 1. A non-invasive spectrometric device for assessing the level of  
4 hemoglobin in mammalian tissues comprising (a) wavelength  
5 filter means for transmitting or reflecting wavelengths of  
6 light; (b) light intensity sensor means arranged and disposed  
7 to measure the intensity of the wavelengths transmitted or  
8 reflected by the wavelength filter means and generate an  
9 electrical signal therefrom, (c) output processing means  
10 connected to the light intensity sensor means to receive and  
11 process the output therefrom; and (d) display means  
12 connected to the output processing means to display the  
13 output.
- 14 2. The device of claim 1 wherein the light intensity sensor  
15 means is arranged and disposed in stacked relation to the  
16 wavelength filter means such that wavelengths of light are  
17 transmitted through the wavelength filter means into the  
18 light intensity sensor means.
- 19 3. The device of claim 1 wherein the light intensity sensor  
20 means is arranged and disposed in angular relation to the  
21 wavelength filter means such that wavelengths of light are  
22 reflected from the wavelength filter means into the light  
23 intensity sensor means.
- 24 4. The device of claim 1 wherein the wavelength filter means  
25 comprises at least one pair of planer substrates in parallel-

- 1           opposed relation, at least one layer of light-wavelength  
2           modulating material disposed between the pair of planer  
3           substrates to achieve spectral coverage in the visible light  
4           spectrum, and a power source in power-providing  
5           communication with the substrate.
- 6        5.    The device of claim 4 wherein the substrates are electrically  
7           conducting substrates.
- 8        6.    The device of claim 4 wherein the light-wavelength  
9           modulating material comprises deformed helix ferroelectric  
10          liquid crystals (DH-FLC), electrically tuned to exhibit pre-  
11          determined wavelength selection properties.
- 12       7.    The device of claim 6 wherein the molecules in the layers of  
13          the DH-FLC are aligned perpendicular to the surfaces of the  
14          planer substrates.
- 15       8.    The device of claim 5 wherein the power source is in  
16          electrical communication with the substrates to create an in-  
17          plane electric field.
- 18       9.    The device of claim 4 wherein the power source is in thermal  
19          communication with one of the pair of substrates to create a  
20          temperature change in the wavelength modulating material.
- 21       10.   The device of claim 9 wherein the power source is a  
22          transparent resistive heater positioned on the planer exterior  
23          surface of one of the pair of substrates.

- 1        11.    The device of claim 5 wherein the light-wavelength  
2            modulating material comprises a layer of holographic  
3            polymer dispersed liquid crystals (H-PDLC).
- 4        12.    The device of claim 11 wherein one layer of H-PDLC is  
5            arranged between two parallel-opposed electrically  
6            conducting substrate layers so as to form a spatial gradient  
7            in the H-PDLC from one edge of the substrate layers to the  
8            opposing edge of the substrate layers.
- 9        13.    The device of claim 11 wherein one layer of H-PDLC is  
10           arranged between two parallel-opposed electrically  
11           conducting substrate layers and wherein the H-PDLC has an  
12           index of refraction variable in response to an applied electric  
13           field.
- 14       14.    The device of claim 11 comprising a stack composed of a  
15           plurality of layers of H-PDLC arranged in alternating,  
16           superposed, relation to a plurality of substrate layers,  
17           wherein the number of substrate layers equals the number of  
18           layers of H-PDLC plus one.
- 19       15.    The device of claim 12 wherein the stack is composed of  
20           between two and twenty layers of H-PDLC layers.
- 21       16.    The device of claim 5 wherein the light-wavelength  
22           modulating material comprises at least one layer of cholesteric  
23           liquid crystals (CLC).
- 24       17.    The device of claim 14 forming a stack composed a plurality  
25           of CLC layers arranged in alternating, superposed, relation to

- 1 a plurality of substrate layers, the plurality of CLC layers  
2 having the capacity to reflect light of different, per-  
3 determined wavelengths, the stack having a number of  
4 substrate layers one greater than the number of CLC layers  
5 and wherein the power source produces electrical energy  
6 perpendicular to the pitch axis of the CLC layers.
- 7 18. The device of claim 15 further comprising a passive optical  
8 element disposed in parallel relation between two reflective  
9 CLC of opposite-handedness.
- 10 19. The device of claim 16, composed of one layer of CLC  
11 disposed between two layers of electrically conducting  
12 substrate, wherein the one layer of CLC is subjected to a in-  
13 plane electric field to produce different pitch sizes as the  
14 electric field is increased.
- 15 20. The device of claim wherein the light intensity sensor means  
16 is selected from the group consisting of an array of CCD and  
17 a photodiode.  
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